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## ROOF RACK FOR VEHICLES

[0001] This application claims the priority of German Patent Documents 102 42 281.8, filed September 12, 2002, and 103 15 329.2, filed April 4, 2003, the disclosures of which are expressly incorporated by reference herein.

### BACKGROUND AND SUMMARY OF THE INVENTION

[0002] The invention relates to a roof rack for vehicles.

[0003] German Patent Document DE 195 43 218 A1 discloses a roof rack for vehicles which has a basic carrier which can be stationarily fixed on the vehicle. A load carrier is connected with the basic carrier and can be displaced into a inclined loading position on the base carrier and into a lifted transport position on the vehicle roof.

[0004] It is an object of the invention to provide an improved roof rack for a motor vehicle which comprises a loading aid which is easy to handle, is safely supported in a loading position and, in a transport position, is held in a secured manner on the roof rack.

[0005] The principal advantages achieved by the invention are that, by means of the loading element, which consists of a load bearing structure and can be swung out laterally of the vehicle, for example, bicycles can be put on at a low height from the vehicle side, and these bicycles are then lifted by the loading element onto the vehicle roof.

[0006] For this purpose, the load rack includes two transversely extending and stationary profiled carriers. On each vehicle side, the loading element having a load bearing structure is displaceably guided by way of adjusting levers into an extended inclined loading position and into a retracted transport position on the vehicle roof. The loading element preferably includes two swivellable profiled carriers respectively on each vehicle side. The profiled carriers are connected on the end side by a carrier

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rod, and the free ends of the profiled carriers facing away from the carrier rod are each connected with an adjusting lever.

[0007] With the adjusting lever, the loading element can be adjusted laterally of the vehicle into a inclined loading position in such a manner that the loading element can take up a downward-directed inclined position. For this purpose, according to the invention, the adjusting lever is held by its one end swivellably by way of a pin in a swivellable profiled carrier and, by its other end, which faces away, the adjusting lever is displaceably arranged by way of a sliding element in a stationary profiled carrier of the load carrier.

[0008] To securely support the loading element on the load carrier and on the stationary profiled carriers in the inclined loading position, the adjusting lever is held by a first supporting surface on a stationary stop of the stationary profiled carrier. In the inclined loading position, the first supporting surface of the adjusting lever is arranged in a vertical plane and is situated opposite a corresponding surface of the stop. A second supporting surface of the adjusting lever is arranged with respect to the swivellable profiled carrier at an angle with respect to the first supporting surface of the adjusting lever.

[0009] To easily position the profiled carriers of the loading element of both vehicle sides with respect to one another, in the transport position on the vehicle roof, the profiled carriers of the loading element are connected by way of a stationary plug-type element with the directly opposite profiled carrier of the other loading element. In particular, the plug-type element includes a wedge-shaped insertion part into which the profiled carriers can be slid. The plug-type element is preferably fixedly connected with the stationary profiled carrier and is centered on both sides in a wedge shape. The two loading elements (profiled carriers) are mutually fixed in the Z-direction.

[0010] According to an embodiment, a locking of the movable profiled carriers of the loading element at the stationary profiled carriers of the load carrier can take place by way of resilient detents which are arranged in a stationary closing cap.

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[0011] To provide guidance of the profiled carriers for taking up the transport position on the stationary profile carriers situated below, and to ensure the entry of the free ends of the profiled carriers into the corresponding plug-type element, the stationary stop in each case has lateral guiding grooves in which guide webs engage. The guiding grooves are stationarily held on the profiled carrier and are arranged on both sides of the stop. The guide webs are provided on the end side of the profiled carriers and are used to slide the profiled carriers in the case of a transport position. Therefore, according to the invention, by way of the stop, in addition to the guiding tasks, advantageously, vertical forces can be additionally absorbed.

[0012] For fixing the profiled carriers situated on top on the stationary profiled carriers arranged underneath in the transport position, one locking pin respectively is provided on the profiled carriers situated on top. The locking pin, in the transport position, projects into a corresponding opening of the stationary profiled carrier. Preferably, the locking pin is held on the end side on a spring element. The adjusting element is connected with the spring element, which adjusting element is arranged outside the profiled carrier and is connected by way of a bent-away tongue of the spring element with the adjusting element on the profiled carriers. At its rearward end facing away from the locking pin, the spring element has a bent-away section which is connected with the profiled carrier.

[0013] Other objects, advantages and novel features of the present invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Figure 1 is a diagrammatic representation of a load carrier, for example, for bicycles, having a loading element which has been swung out on one side;

[0015] Figure 2 is a diagrammatic representation of a part of the loading element with swung-out profiled carriers of the loading element;

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[0016] Figure 3 is an enlarged representation of a swung-out profiled carrier of the loading element with the adjusting lever and the stop;

[0017] Figure 4 is a view of onto the adjusting lever;

[0018] Figure 5 is a lateral view of the adjusting lever which is linked in the profiled carrier and has a stop;

[0019] Figure 6 is a sectional view according to Line VI-VI of Figure 3 of the adjusting lever;

[0020] Figure 7 is a diagrammatic representation of a plug-type element in a profiled carrier of the loading element;

[0021] Figure 8 is a bottom view of a resilient locking tongue in a recess of a stationary profiled carriers;

[0022] Figure 9 is a view of a closing cap with a lock and a key;

[0023] Figure 10 is an interior view of the closing cap with the resilient locking tongue;

[0024] Figure 11 is a lateral view of a stationary profiled carrier with a stop which is arranged on the end side and has guide grooves;

[0025] Figure 12 is a sectional view according to Line XII-XII of Figure 11;

[0026] Figure 13 is a vertical sectional view of a profiled carrier with guide webs situated in the interior;

[0027] Figure 14 is a cross-sectional view of a profiled carrier with guide webs situated in the interior according to Figure 13;

[0028] Figure 15 is a partial cross-sectional view of a profiled carrier and a stationary profiled carrier having a locking pin; and

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[0029] Figure 16 is a top view of a spring element with a locking pin and an exterior-side adjusting element viewed in the direction of the arrow Z of Figure 15.

#### DETAILED DESCRIPTION OF THE DRAWINGS

[0030] As illustrated in detail in Figure 1, a load carrier 1 comprises in each case two transversely extending profiled carriers 3, 4 which are fastened on a roof rack 2 with the fastening elements 5, such as adapters. The fastening elements 5 reach, for example, over a tubular carrier or the like. The roof rack 2 itself is connected with the vehicle, which is not illustrated in detail.

[0031] On the profiled carriers 3, 4 of each vehicle side, a loading element 6 is in each case adjustably held by way of adjusting levers 7, 8 on each side A and B of the vehicle. This loading element 6 includes swivellable profiled carriers 9, 10 which are mutually connected by a carrier rod 11.

[0032] The loading element 6 of each vehicle side A and B can be displaced by way of the adjusting levers 7, 8 into a lateral inclinedly swung out loading position I and into a transport position II which is deposited on the profiled carriers 3, 4, as illustrated in detail in Figure 1.

[0033] As shown in Figures 3 and 4, at one end 14, the adjusting lever 7, 8 is connected by way of a pin 15 with the swingable profiled carriers 9, 10 and, at the other end 13, it can be displaced by way of a sliding element or by way of a roller 16 in the stationary profiled carrier 3, 4.

[0034] Returning to Figure 1, the loading element 6 is pulled from the transport position II on the vehicle roof by the guide by way of the sliding element 16 in the direction of the arrow 17 into the inclined loading position I against a stationary stop 18 in the profiled carrier 3, 4. The profiled carrier 3, 4 has a supporting surface 19 (Figure 6) which is arranged in a vertical plane X-X and is situated opposite a corresponding supporting surface 20 of the adjusting lever 7, 8. Furthermore, the adjusting lever 7, 8 has another supporting surface 21 which is set at an angle  $\varnothing$  with respect to the supporting surface 19, 20 and which places itself onto the interior side of

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the profiled carrier 9, 10. In this inclined swung-out loading position I, a supporting of the profiled carriers 9, 10 therefore takes place by way of the supporting surfaces 19, 20 and 21 as well as on a support 22 at the free end of the stationary profiled carriers 3, 4.

[0035] As shown in Figure 7, a plug-type element 23 is provided on the stationary profiled carrier 3, 4. The plug-type element 23 - in the top view and in the lateral view has a wedge shape. The opposite profiled carriers 9 and 10 respectively can be fitted into the plug-type element 23, so that the two mutually connected profiled carriers have a precise arrangement with respect to one another and are connected with one another.

[0036] As shown in Figure 1, at the free end 26 of the swivellable profiled carrier 9, 10, one closing cap 27 respectively is provided which comprises a closing part 28 and which, according to one embodiment, is provided with a resilient locking tongue 29. In the transport position II, the resilient locking tongue 29 locks into a bottom-side recess 30 (Figure 8) of the stationary profiled carrier 3, 4 and fixes the profiled carrier 3, 4. By way of a key 31, the closing part 28 is rotated into a detent receiving device and is fixed.

[0037] For the fixed guiding of the profiled carrier 8, 9 on the stationary profiled carriers 3, 4 arranged underneath, the profiled carriers 8, 9 have guide webs 18c and 18d which are situated in the interior and arranged at the end side. During the displacement of the profiled carriers 8, 9 from the loading position I into the transport position II and vice-verse, these guide webs 18c and 18d engage in lateral guide grooves 18a and 18b of the stop 18, which is illustrated in detail in Figures 11 to 14.

[0038] For locking the profiled carriers 8, 9 in the transport position I on the profiled carriers 3, 4 situated underneath, a manually adjustable locking pin 35 (Figures 15 and 16) is provided in each profiled carrier 8, 9 which, in the locking position, engages with its shaft in an opening 36 of the profiled carrier 3, 4 arranged underneath. In this position, the profiled carriers 8, 9 take up the transport position II.

[0039] When the loading position I is initiated, the locking pin 35 on each profiled carrier 8, 9 has to be released; that is, must be pulled up out of the opening 36 in the

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direction of the arrow 41 by way of the exterior adjusting element 38, until the end of the pin 35 is flush with respect to the bottom surface of the profiled carrier 8, 9. Only then can the profiled carriers 8, 9 be pulled out by way of the connecting carrier rod 11.

[0040] The locking pin 35 is connected with a spring element 37, for example, an oblong leaf spring, which can be fastened on the interior side of the profiled carrier 8, 9 by way of an end-side bent-away section 40 on the profiled carrier 8, 9.

[0041] The adjusting element 38 is connected with the spring element 37 in the area of the locking pin 35 by way of a tongue 39 extending through the profiled carrier 8, 9 through a slot 42. This permits movement of the adjusting element 38 in the direction 41 under spring tension. After a release of the adjusting element 38, the adjusting element 38 rebounds into its locking position; that is, the shaft of the pin 35 juts out.

[0042] The foregoing disclosure has been set forth merely to illustrate the invention and is not intended to be limiting. Since modifications of the disclosed embodiments incorporating the spirit and substance of the invention may occur to persons skilled in the art, the invention should be construed to include everything within the scope of the appended claims and equivalents thereof.